Establishing Regular Measurements of Halocarbons at Taunus Observatory

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In late 2013 an ongoing whole air flask collection program was started at the Taunus Observatory (TO) in central Germany. Being a rural site in close vicinity to the densely populated Rhein-Main area with the city of Frankfurt, Taunus Observatory allows assessment of local and regional emissions but due to its altitude of 825m also regularly experiences background conditions (Figure 1). With its large caption area, halocarbon measurements at the site have the potential to improve the database for estimation of regional and total European halogenated greenhouse gas emissions.

Currently, flask samples are collected weekly for analysis using a Gas Chromatography Mass Spectrometry (GC-MS) system at Frankfurt University employing a quadrupole as well as a time-of-flight (TOF) mass spectrometer. The TOF instrument yields full scan mass information and allows for retrospective analysis of so far undetected non-target species. For quality assurance, additional samples are collected approximately bi-weekly at the Mace Head Atmospheric Research Station (MHD) in parallel with sampling for NOAA's Halocarbons & other Atmospheric Trace Species (HATS) flask sampling program. Samples get analyzed in Frankfurt following the same measurement procedure as TO flask samples. Thus the TO time series can be linked to both the *in situ* Advanced Global Atmospheric Gases Experiment (AGAGE) measurements and the NOAA flask sampling program at MHD. In 2017 it is planned to supplement the current flask sampling by employing an *in situ* GC-MS system with a TOF mass spectrometer at the site, thus increasing the measurement frequency.

We will present the time series of selected halocarbons recorded at Taunus Observatory. While there is good agreement of baseline mixing ratios between TO and MHD, measurements at TO are regularly influenced by elevated halocarbon mixing ratios (Figure 2). An analysis of HYSPLIT trajectories for the existing time series revealed significant differences in halocarbon mixing ranges depending on air mass origin.

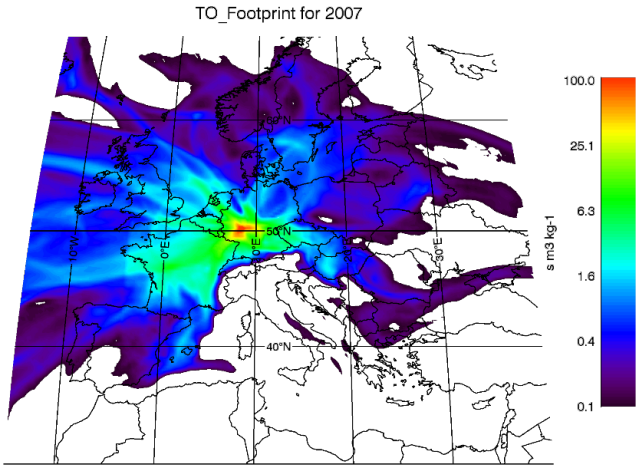

Figure 1. Footprint of the Taunus Observatory. Air masses are influenced by regional emissions (red/yellow area) but the site also regularly experiences a maritime influence from the northwest *(courtesy D. Brunner)*.

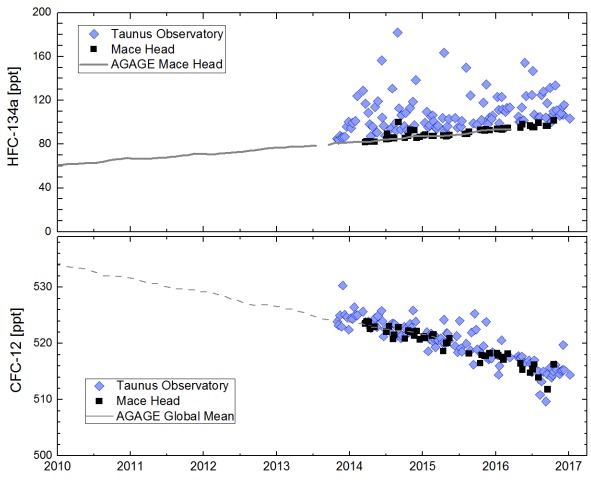

Figure 2. Time series of HFC-134a (top) and CFC-12 (bottom) at Taunus Observatory and Mace Head. HFC-134a is still widely used in air conditioning thus showing an increasing trend and strongly varying mixing ratios at TO. Usage of CFC-12 is phased out; it exhibits decreasing mixing ratios and comparable variability at TO and MHD.